ii. Magnet Bus

The power supplies for the collider magnets are distributed in the service buildings and in the tunnel alcoves. All magnets, with the exception of the sextupoles and the magnets in the corrector packages, are powered from the service building. Power is carried to the magnets from the service buildings using superconductors. These superconductors are bundled into an assembly called the Cold Crossing Bus (CCB). The power leads within each sextant of a ring are carried to the service building in two CCBs, one containing the main dipole current, and the other the quadrupole current. The two CCBs are identical, except that the quadrupole CCB has one additional conductor. The CCB is also used to carry power across warm sections of the ring, such as the space between the CQ3 and CQ4 magnets.

The cross section of the CCB is shown in Fig. 2-1. Wherever the CCB is used, the currents always sum to zero. This means that the critical current rating will be based on a magnetic field of essentially zero strength. The conductors are also given a MIITs $\left(\int I^2\,dt\right)$ rating as a measure of how much energy the copper in the cable can withstand during a quench. Table 2-2 lists these ratings.

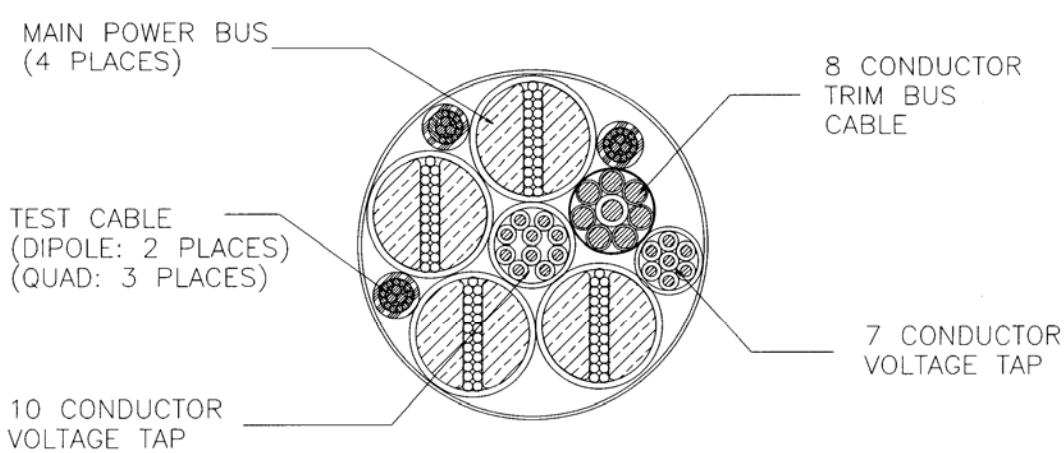

Fig. 2-1. Cold Crossing Bus

Table 2-2. Cold Crossing Bus Ratings

Conductor	Current Ratings, A Critical	Operating	MIITs (10^6 A^2 sec)
Main Power	11000	6600	204
Test Cable	1800	600	1.50
Trim Bus	1800	150	0.11

The diagrams of Figs. 2-2 and 2-3 show the dipole and quadrupole bus arrangements. The dipole circuit is powered from the 4:00 insertion region, with the return busses coming back at 10:00. Dump resistors are at 4:00 and 10:00, and are split for symmetry. The insertion dipoles, D0, and in the blue ring, DX, are connected in the return path. This keeps them near ground potential during a quench, and is done to minimize the stress on power supplies shunting them. In the quadrupole circuit, the H/V Offset also has quench protection, but it is not shown.

The quadrupole circuit is also powered at 4:00 with a return at 10:00. In this configuration, the vertical quads are powered on one bus, while the horizontal quads are on the other. This allows a trim supply to offset the current in the horizontal bus with respect to the vertical bus. The insertion quads placement is also shown here, and the circuits powering Q8 and Q9 will have the capability to offset the trim current, making the base current in the insertion quads independent of the trim setting.

In Fig. 2-2 there is a table of Inductances. The arc dipole is 25mH. The dipole sextant is made up of arc dipoles D10-D20 and D20-D10. Each one of these dipoles is 25mH and the total is 25mH*22 magnets for a total of 550mH. In Fig. 2-2 between 8:00 and 10:00, D5O(I) indicates D5 outer for blue and inner for yellow. Then between 6:00 and 8:00 D5I(O) indicates D5 inner for blue and outer for yellow. The energy extraction resistor values, at 4:00 and 10:00 in Fig. 2-2, for the yellow ring are in parenthesis and the values for the blue ring are not in parenthesis. In Fig.2-3 a quad sextant is defined as $Q_V + Q_H$. Where Q_H = 11 magnets*1.5mH = 16.5mH and Q_V = 12 magnets*1.5mH = 18mH. 16.5mH + 18mH = 34.5mH for a quad sextant. The11 magnets in Q_H are Q11, Q13, Q15, Q17, Q19, Q21, Q19, Q17, Q15, Q13 and Q11. The 12 magnets in Q_V are Q10, Q12, Q14, Q16, Q18, Q20, Q20, Q18, Q16, Q14, Q12, Q10.

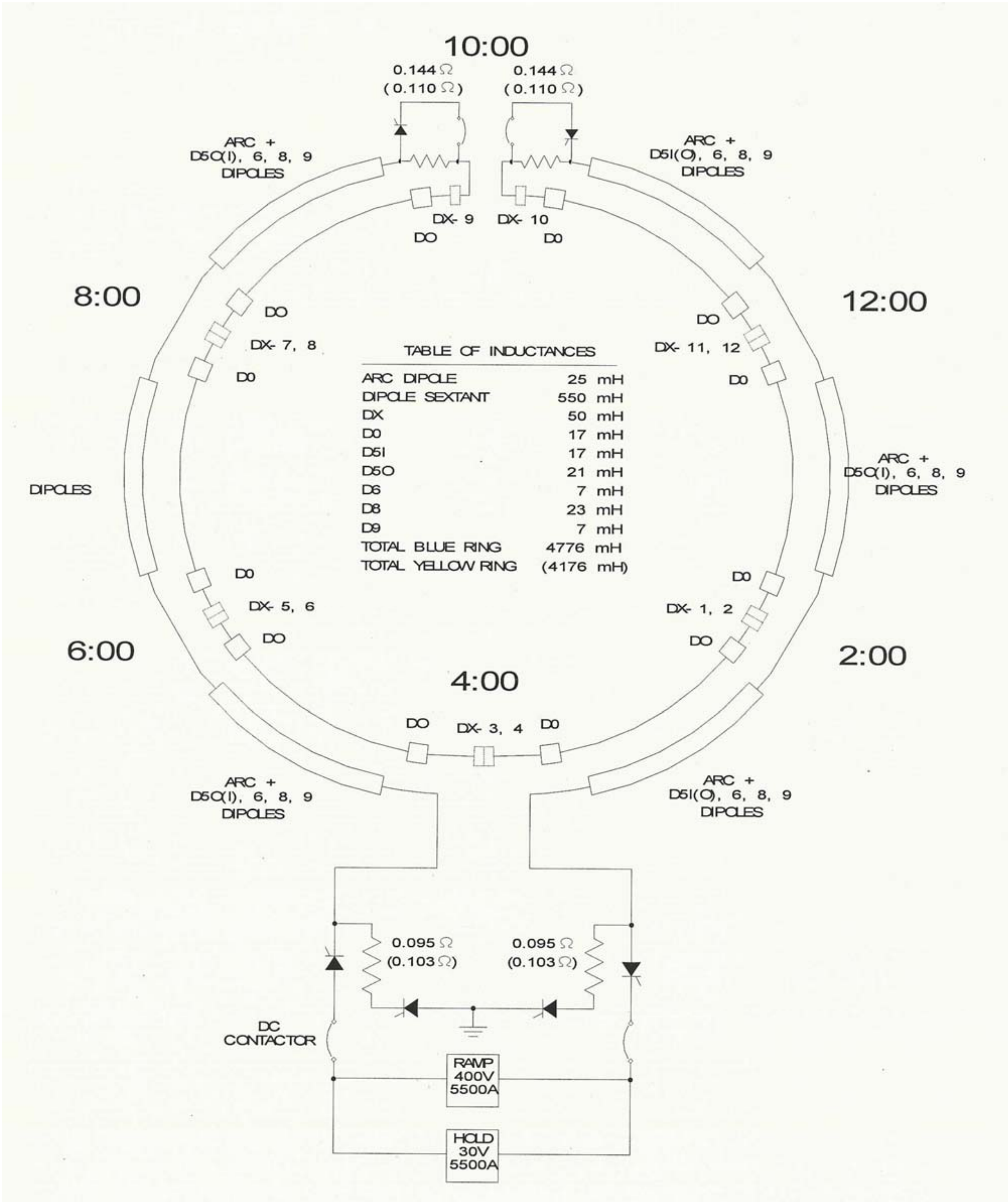

Fig. 2-2. Main dipole bus layout. The DX dipoles are in the blue ring bus only.

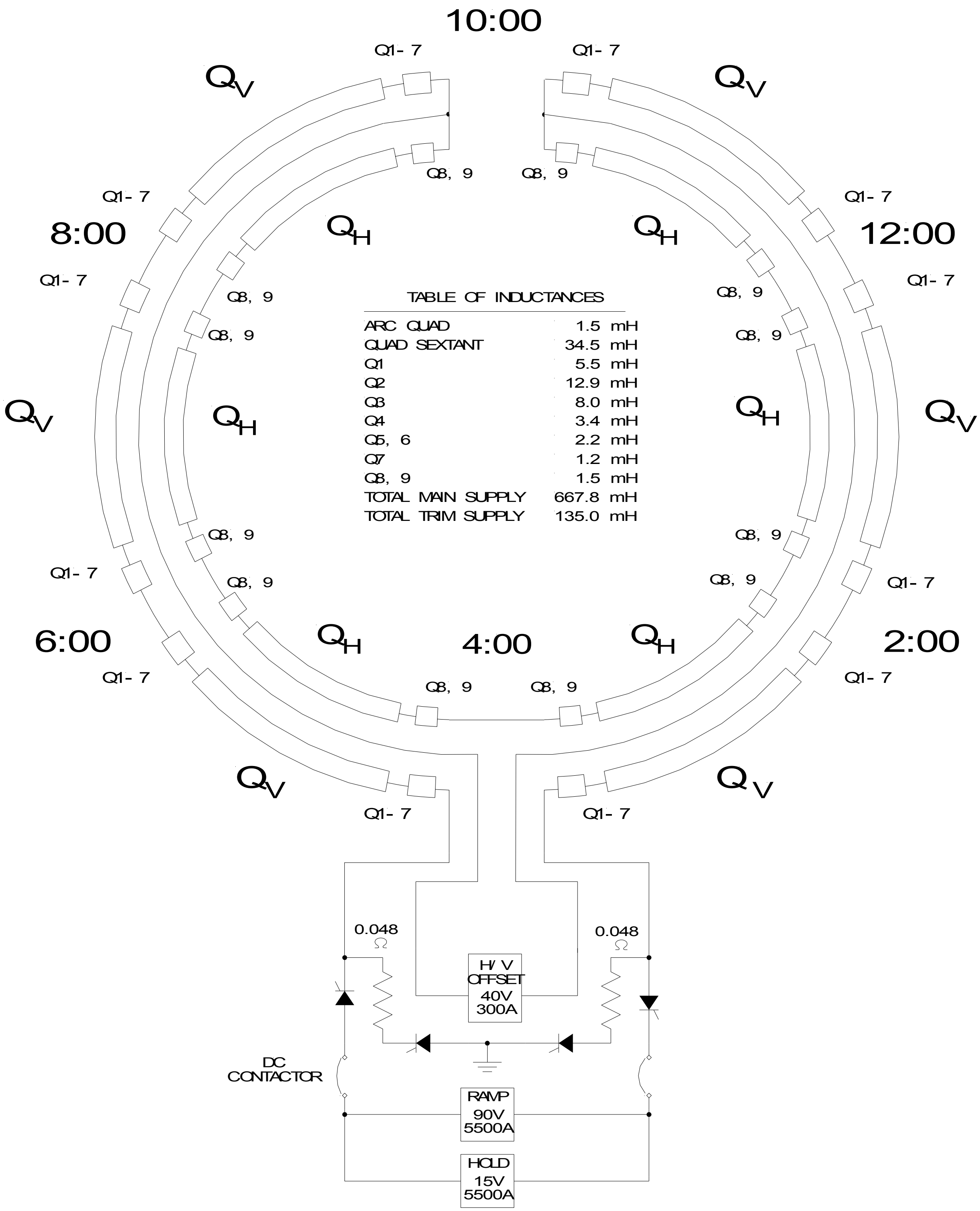

Fig. 2-3. Main quadrupole bus layout.